

## Section 7.4

### Stormtreat Filter BMP

#### 7.4.1 Description

Stormtreat structures as developed by manufacture control stormwater quality by capturing and retaining runoff and passing it through a filter bed comprised of a specific soil media. Soil filters having a mixture of silty sand and organic matter achieve the highest removal rates as they can remove a wide range of pollutants from stormwater, including suspended sediment, phosphorus, nitrogen, metals, hydrocarbons and some dissolved pollutants. Once through the soil media, the runoff is discharged slowly downstream with a control valve. The filter structure provides for the slow release of smaller storm events, minimizing stream channel erosion, as well as cooling the discharge. Stormtreat structures are usually located in close proximity to the origin of the stormwater runoff and an upgradient storage structure is provided to detain the volume of runoff that needs to be treated through the structure. The slow discharge also cools the runoff, reducing thermal impacts to receiving streams. If flood control is required, detention within the structure or in parallel to must be provided.

Filter structures must detain a runoff volume equal to the sum of 1.0 inch times the subcatchment's impervious area plus 0.4 inch times the subcatchment's landscaped developed area. The peak storage depth of the channel protection volume should be designed to drain dry within 24 to 48 hours.

When used to meet the phosphorus allocation in lake watersheds, the sizing of the underdrain filter structures need to be adjusted in accordance with Volume II of this BMP manual.

Storage and detention for flooding conditions and to meet the 2, 10 and 25-year peak flow control must be stored in parallel to a Stormtreat structure.

The Stormtreat structure must be planted with plant species that are tolerant of draught conditions with frequent inundation. Full vegetation must be achieved within the first year following construction.

A stormwater treatment system that uses a combination of upstream storage draining to Stormtreat tanks is considered an approved alternative to the General Standard BMPs provided it is designed, installed and maintained in accordance with the following criteria.

#### 7.4.2 Site Suitability Criteria

**Drainage Area:** The required number of Stormtreat structures and storage capacity over the filter is based on the size and land use within the area draining to the structure.

**Outlet:** The channel protection volume must be discharged solely through an underdrained vegetated soil filter bed with a network of underdrain pipe having a single outlet with a diameter no greater than eight inches. A manually adjustable valve may be installed to control the outflow rate from the underdrain pipe to obtain the required 24 to 48 hour release time.

**Underdrain Outlet:** Each underdrain system must discharge to an area capable of withstanding concentrated flows and saturated conditions without eroding.

**Sediment Pretreatment:** Pretreatment devices such as grassed swales, grass or meadow filter strips and sediment traps shall be provided to minimize the discharge of sediment to the underdrained soil filter. Pretreatment structures shall be sized to hold an annual sediment loading calculated using a sand application rate of 50 cubic feet per acre per year for sanding of roadways, parking areas and access drives within the subcatchment area.

**Access:** Where needed, a maintenance access shall be planned for and maintained that is at least 10 feet wide with a maximum slope of 15% and a maximum cross slope of 3%. This access should never cross the emergency spillway, unless the spillway has been designed for that purpose. An easement for long-term access may be needed.

### 7.4.3 General Design Criteria

The following design criteria apply to the designing treatment with Stormtreat tanks:

**Treatment Volume:** The sum of the volume of upstream storage and available storage volume in the Stormtreat tank(s) must be equal to at least the sum of 1.0 inch of runoff from the impervious areas that drain to the system and 0.4 inches of runoff from the landscaped areas that drain to the system.

**Size of area:** The Stormtreat system must have at least one Stormtreat tank per 1210 cubic feet of stored and treated volume. To determine the number of Stormtreat tanks required divide the volume, in cubic feet, from #1 above by 1210 and round up.

**Tanks in Parallel:** If more than one tank is required the tanks should be arranged in parallel with a 4 inch diameter inflow pipe manifold from the upstream storage and a 2 inch diameter pipe outflow manifold. Tanks should be installed at the same elevation.

**Discharge elevation:** The elevation of the bypass spillway or diversion for upstream storage should be no greater than 4 feet above the elevation of the Stormtreat tank(s) outlet which is 0.5 feet above the tank bottom.

**Flow Control:** A valve must be located at the end of the outflow manifold to control discharge from the system. The valve must be set, by actual field measurement, so that the flow discharged from the system is equal to 2.0 gallons per minute per tank when the elevation of water in the system is 2.0 feet above the tank(s) outlet (2.5 feet above the

bottom of the tank(s)). This can most easily be set by capping the inflow pipe into the first settling chamber in each Stormtreat tank to prevent backflow and filling the tank(s) to the required elevation. Then the valve can be set so that the required flow, no more and no less, is passed. Volumetric flow measurement with a known volume container and a stopwatch is the preferred means of flow measurement.

**Filter composition:** (Recommended/Under consideration) The gravel in the filter chambers of the Stormtreat tank consists of well graded gravel with at least 4% to 8% fines passing the #200 sieve.

**Pretreatment:** The 25% reduction in the required treatment volume that is available for underdrained soil filters if an approved pretreatment device is installed upstream of the filter is not available for Stormtreat systems.

### 7.4.4 Specific Design Criteria

**Filter Permeability:** The filter media is provided by the manufacture and must be permeable enough to insure drainage within 48 hours maximum, yet have sufficient fines to insure filtration of fine particles and removal of dissolved pollutants. The design may either rely on the soil permeability, if known, to provide the slow release of the water treatment volume over a minimum of 24 hours, or may insure this rate by installing a constrictive orifice or valve on the underdrain outlet. In determining the permeability of the media, the percent fines of the mixture and the level of compaction should be considered.

**Vegetation:** The surface of the soil filter surface must be planted with a grass species that is tolerant of frequent inundation and well drained soils such as soft stem bulrush and burreed (sparganium). The wetland plants are maintained between storms by a minimum of 6 inches of water in the bottom of the wetland basin. The standing water provides for soil moisture through capillary action.

## 7.4.5 Construction Criteria

**Manufactures Specifications:** Install the Stormtreat system in accordance with manufactures specifications.

**Excavation:** The area of the basin may be excavated in preparation of the installation of the underdrain and can be used for a sediment trap from the site during construction. After excavation of the basin, the outlet structure and piping system must be installed at the appropriate elevation and protected with a sediment barrier. If the basin is to be used as a sediment trap, the sides of the embankments must be mulched and maintained to prevent erosion.

**Outlet Discharge** Outflow of the filter basin underdrain can be controlled by a constrictive orifice or a valve (2" plastic ball valve, type 346, with a ball valve handle extension, type 615, with a three-piece valve box shall be installed over the valve). Upon completion of the installation of the soil filter media and the establishment of 90% catch of grass over the filter media, the contractor shall flood the vegetated basin to the design elevation with clean water and adjust the outflow to obtain a 24 hour to 32 hour release time.

**Finished Elevation:** Finish grade outside the tank rim shall be at the rim elevation surface runoff from the island interior shall be directed to the top of tank.

**Backfill:** Fine stone for the wetland area of the tank shall be MEDOT fine aggregate for concrete (MEDOT Specification 703.01)

**Construction Sequence:** Erosion and sedimentation from unstable subcatchments is the most common reason for filter failure. Not heeding the construction sequencing criteria is likely to result in the need to replace the soil filter. The soil filter median and vegetation must not be installed until the area that drains to the filter has been permanently stabilized with pavement or other structure, 90% vegetation cover, or permanent stabilized.

Otherwise, the runoff from the contributing drainage area must be diverted around the filter until stabilization is completed or the Department has approves, on a case-by-case basis, that appropriate measures were taken to prevent erosion of material from the unstable catchment area and deposition on the filter.

### Outflow Adjusting

Outflow Rate: The following procedure may be used to set the outflow rate:

- Close outlet valve.
- Cap the inflow pipe into the first settling chamber in each Stormtreat tank to prevent backflow.
- Fill the tanks with clean water to 2/0 feet above the tank's outlet.
- Open the valve so that the required flow is met.
- Flow shall be determined by a volumetric flow measurement with a known volume container and a stopwatch.

### Inflow Adjustment:

The inlet control valve shall be adjusted so that the flow from the outlet control structure is 10 gallons per minutes

- Close the inlet valve.
- Plug the 2 inlet pipes to the outlet control structure.
- Fill the structure with clean water to the elevation of the bulkhead orifice.
- Open the valve so that the required flow is met.
- Flow shall be determined by a volumetric flow measurement with a known volume container and a stopwatch.

### Construction Oversight:

Inspection of the installation shall be provided for each phase of construction by the design engineer and vendor with required reporting to the DEP. At a minimum, inspections will occur:

- After preliminary construction of the excavation grades and once the tanks are installed but not backfilled.
- After the tanks has been installed, backfilled and vegetated.

- During the in and out flow regulation and valve setting.
- After one year to inspect vegetation uptake and make corrections.

**Quality Control:** The contractor shall inspect the system immediately after the first rainfall of once or more. Stormwater shall not overflow the Stormtreat rim. If an overflow condition is discovered, the contractor shall slowly close the inlet control valve in quarter turn increments until the overflow is stopped. Each quarter turn shall be spaced 2 minutes apart to allow the system to reach equilibrium.

### 7.4.6 Maintenance Criteria

During the first year, the basin will be inspected semi-annually and following major storm events.

Debris and sediment buildup shall be removed from the forebay and detention basin as needed. Mowing of grassed basin can occur semi-annually to a height no less than 6 inches. Any bare area or erosion rills shall be repaired with new filter media or sandy loam, seeded and mulched.

Maintaining good grass cover will minimize clogging with fine sediments and if ponding exceeds 48 hours, the top of the filter bed must be rototilled to reestablish the soil's filtration capacity.

**Maintenance Agreement:** A legal entity should be established with responsibility for inspecting and maintaining any Stormtreat structures. The legal agreement establishing the entity should list specific maintenance responsibilities (including timetables) and provide for the funding to cover long-term inspection and maintenance.

**Sediment Removal:** Sediment and plant debris should be removed from the pretreatment structure at least annually.

**Fertilization:** Fertilization of the planting on the structure must be avoided.

**Harvesting and Weeding:** Harvesting and pruning of excessive growth will need to be done occasionally. Weeding to control unwanted or invasive plants may also be necessary. Add new mulch as necessary for bioretention cell.